

In the Claims

Please cancel claims 5, 10, and 12-16. Please amend claims 1, 7, 17, and 19-20. Please add new claims 21-29. The claims are as follows:

1. (Currently amended) An apparatus comprising:

a chamber adapted for holding a workpiece having a surface layer adapted for being etched; and

a distribution plate including I rings within the distribution plate and around a common point on the distribution plate such that no other ring exists within the distribution plate,

wherein I is an integer of at least 2,

wherein the I rings are denoted as R_1, R_2, \dots, R_I in order of increasing distance from the common point and consist of I_1 rings of a first type and I_2 rings of a second type such that I_1 is at least 1, I_2 is at least 1, and $I_1 + I_2 = I$,

wherein the I rings collectively comprise N channels and no other channels such that each ring of the I rings comprises at least 2 channels of the N channels,

wherein N is at least $2 \cdot I$, wherein the N channels consist of N_1 channels of a first kind within the I_1 rings of the first type and N_2 channels of a second kind within the I_2 rings of the second type such that $N_1 + N_2 = N$,

wherein each channel of the N_1 channels of a first kind are configured to provide a first plurality of channels for providing a first fluid to flow into the chamber at $[[\alpha]]$ a constant angle θ_1 with respect to an exposed surface of the distribution plate,

wherein each channel of the N_2 channels of the second kind are configured to

~~provide and a second plurality of channels for providing~~ a second fluid to flow into the chamber at ~~[[an]]~~ a constant angle θ_2 with respect to the exposed surface of the distribution plate, and

wherein ~~each angle~~ θ_1 and θ_2 ~~[[is]]~~ are each at least 45 degrees and less than 90 degrees,

wherein θ_1 is unequal to θ_2 , and

wherein the first fluid differs from the second fluid;

a first fluid feed line configured to be connected to a source of the first fluid, wherein the first fluid feed line is fluidically coupled to the N_1 channels of the first kind for providing the first fluid to the N_1 channels of the first kind, and wherein the first fluid feed line is not fluidically coupled to the N_2 channels of the second kind and cannot provide the first fluid to the N_2 channels of the second kind; and

a second fluid feed line configured to be connected to a source of the second fluid and to be fluidically coupled to the N_2 channels of the second kind so as to provide the second fluid to the N_2 channels of the second kind, and wherein the second fluid feed line is not fluidically coupled to the N_1 channels of the first kind and cannot provide the second fluid to the N_2 channels of the first kind.

2. (Canceled)

3. (Previously presented) The apparatus of claim 1, wherein paths of the first plurality of channels and paths of the second plurality of channels originate in an XY plane of the

distribution plate and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane and wherein each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane, and wherein each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane, and wherein α_1 , β_1 , α_2 , and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane.

4. (Original) The apparatus of claim 1, wherein the distribution plate comprises a material selected from the group consisting of polytetrafluoroethylene, fluorinated ethylene propylene, acetyl homopolymer resin, polyimide, polyetherimide, polyarylate, polycarbonate, and combinations thereof.

5. (Canceled)

6. (Previously presented) The apparatus of claim 1, wherein paths of the fluids through the distribution plate further comprises grooves and wherein a volume of the grooves is greater than a volume of the channels.

7. (Currently amended) The apparatus of claim 1, wherein the rings around the ~~center~~ common point ~~[[of]]~~ on the distribution plate have shapes selected from the group consisting of circles, ellipses, rectangles, squares and combinations thereof.

8. (Original) The apparatus of claim 1, wherein the chamber further comprises a lower annular ring that includes a plurality of holes extending over an exhaust port.

9. (Original) The apparatus of claim 1, wherein the chamber further comprises an upper annular ring, wherein a space is created between an edge of the upper annular ring and a wall of the chamber, and wherein the space restricts a flow of fluids in the chamber.

10. (Canceled)

11. (Original) The apparatus of claim 1, wherein the distribution plate is located from about 1/8 inch to about 3 1/2 inches from a surface of the workpiece.

12-16. (Canceled)

17. (Currently amended) A distribution plate, comprising:

~~a first plurality of channels for providing a first fluid to flow into a chamber at an angle θ_1 with respect to an exposed surface of the distribution plate; and~~
~~a second plurality of channels for providing a second fluid to flow into the chamber at an angle θ_2 with respect to the exposed surface of the distribution plate, wherein the first plurality of channels and the second plurality of channels are arranged in rings around a common point of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees~~ I rings within the distribution plate and around a common point on the

distribution plate such that no other ring exists within the distribution plate,

wherein I is an integer of at least 3,

wherein the I rings are denoted as R_1, R_2, \dots, R_I in order of increasing distance from the common point and consist of I_1 rings of a first type and I_2 rings of a second type such that I_1 is at least 1, I_2 is at least 1, and $I_1 + I_2 = I$,

wherein the I rings collectively comprise N channels and no other channels such that each ring of the I rings comprises at least 2 channels of the N channels,

wherein N is at least $2 \cdot I$,

wherein the N channels consist of N_1 channels of a first kind within the I_1 rings of the first type and N_2 channels of a second kind within the I_2 rings of the second type such that $N_1 + N_2 = N$,

wherein each channel of the N_1 channels of a first kind are configured to provide a first fluid to flow into a chamber at a constant angle θ_1 with respect to an exposed surface of the distribution plate,

wherein each channel of the N_2 channels of the second kind are configured to provide a second fluid to flow into the chamber at a constant angle θ_2 with respect to the exposed surface of the distribution plate,

wherein the chamber is adapted for holding a workpiece having a surface layer adapted for being etched,

wherein θ_1 and θ_2 are each at least 45 degrees and less than 90 degrees,

wherein θ_1 is unequal to θ_2 ,

wherein the first fluid differs from the second fluid, and

wherein three consecutive rings of the I rings are denoted as rings R_K , R_{K+1} , R_{K+2} and are arranged in an alternating pattern such that either rings R_K and R_{K+2} are rings of the first type and ring R_{K+1} is a ring of the second type or rings R_K and R_{K+1} are rings of the second type and ring R_{K+2} is a ring of the first type, subject to K being selected from the group consisting of 1, 2, ... , and I-2.

18. (Canceled)

19. (Currently amended) The distribution plate of claim 17, wherein paths of the first plurality of channels and the second plurality of channels originate in an XY plane of the distribution plate, and wherein each angle θ_1 and θ_2 is at least 45 degrees and less than 90 degrees with respect to the XY plane and wherein each angle θ_1 is offset from the XY plane at an offset angle α_1 and β_1 with respect to the XY plane, and wherein each angle θ_2 is offset from the XY plane at an offset angle α_2 and β_2 with respect to the XY plane, and wherein α_1 , β_1 , α_2 , and β_2 are selected from the group consisting of from about 0 to -45 and from about 0 to +45 degrees with respect to the XY plane.

20. (Currently amended) The distribution plate of claim 17, ~~wherein the first fluid is provided to the first plurality of channels and the second fluid is provided to the second plurality of channels without premixing of the first and second fluids~~

wherein I is at least 4,

wherein if I is an odd positive integer then the I_1 rings of the first type consist of R_1, R_3, \dots

, R_1 and the I_2 rings of the second type consist of R_2, R_4, \dots, R_{I-1} , and

wherein if I is an even positive integer then the I_1 rings of the first type consist of R_1, R_3, \dots, R_{I-1} and the I_2 rings of the second type consist of R_2, R_4, \dots, R_I .

21. (New) The apparatus of claim 1,

wherein the first fluid feed line is connected to the source of the first fluid, and

wherein the second fluid feed line is connected to the source of the second fluid.

22. (New) The apparatus of claim 21,

wherein the first fluid is within the N_1 channels of the first kind and not within the N_2 channels of the second kind, and

wherein the second fluid is within the N_2 channels of the second kind and not within the N_2 channels of the first kind.

23. (New) The apparatus of claim 22,

wherein the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas, and

wherein the first fluid and the second fluid are adapted to react inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece.

24. (New) The apparatus of claim 1, wherein three consecutive rings of the I rings are denoted as rings R_K, R_{K+1}, R_{K+2} and are arranged in an alternating pattern such that either rings R_K and R_{K+2}

are rings of the first type and ring R_{K+2} is a ring of the second type or rings R_K and R_{K+2} are rings of the second type and ring R_{K+2} is a ring of the first type, subject to K being selected from the group consisting of 1, 2, ... , and $I-2$.

25. (New) The apparatus of claim 24,

wherein the first fluid feed line is connected to the source of the first fluid,

wherein the second fluid feed line is connected to the source of the second fluid,

wherein the first fluid is within the N_1 channels of the first kind and not within the N_2 channels of the second kind, and

wherein the second fluid is within the N_2 channels of the second kind and not within the N_2 channels of the first kind.

26. (New) The apparatus of claim 25,

wherein the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas, and

wherein the first fluid and the second fluid are adapted to react inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece.

27. (New) The apparatus of claim 24,

wherein I is at least 4,

wherein if I is an odd positive integer then the I_1 rings of the first type consist of R_1, R_3, \dots, R_I and the I_2 rings of the second type consist of R_2, R_4, \dots, R_{I-1} , and

wherein if I is an even positive integer then the I_1 rings of the first type consist of R_1, R_3, \dots, R_{I-1} and the I_2 rings of the second type consist of R_2, R_4, \dots, R_I .

28. (New) The apparatus of claim 27,

wherein the first fluid feed line is connected to the source of the first fluid,

wherein the second fluid feed line is connected to the source of the second fluid,

wherein the first fluid is within the N_1 channels of the first kind and not within the N_2 channels of the second kind, and

wherein the second fluid is within the N_2 channels of the second kind and not within the N_2 channels of the first kind.

29. (New) The apparatus of claim 28,

wherein the first fluid comprises ammonia gas and the second fluid comprises hydrogen fluoride gas, and

wherein the first fluid and the second fluid are adapted to react inside the chamber to form a self-limiting etchable layer on a portion of the adapted surface layer of the workpiece.